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Hermit Thrush at Nest

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A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. I APRIL, 1930 No. 2

ECTOPARASITES AND BIRD-BANDING

BY HAROLD S. PETERS

UNITED STATES BUREAU OF ENTOMOLOGY

THE ectoparasites found on practically every species of bird must exist at the expense of their hosts. This fact opens many interesting fields of study and raises many questions in which the bird-bander should be interested. The bander has the opportunity to observe the various ectoparasites and the effects they have on the bird and its behavior, and by collecting them will assist in the study of the life history, host-relationship, and classification of the parasites. Banders may find that birds repeating very often in traps and at feeding stations are parasitized, weakened, and unable to seek their own food. These would probably be more tame than birds free from parasites. An infested bird may not rear as many young, may not raise a second brood (in those species which generally have more than one brood a year), and may not protect the nest as well as a healthy bird. Young birds may become infested with parasites from the parent bird during bodily contact in the nest, and so be less able to survive than young raised by uninfested parents. I believe that ectoparasites have a definite effect on the behavior of the birds, probably causing them to have a somewhat shorter migration route, shorter life, smaller size, and dull plumage; to sing less; and perhaps to have a lower and more variable body temperature than birds not infested. It would be interesting to know whether female birds have more parasites than male birds; whether parasites are more numerous on those birds having more than one brood of young each year than on those having a single brood; and whether young birds obtain more of their ectoparasites from the parents in the nest than they obtain after becoming adults, during copulation, in flocks, or in nesting colonies.

All groups of ectoparasites are visible to the unaided eye, and even the eggs and young may be seen and collected without trouble from freshly killed birds. They are generally very difficult to pick from live birds, which are too frightened and restless to be examined easily. It is best for one person to hold the bird while another picks the parasites from among the feathers or from the skin of the host with a pair of small tweezers or forceps. A magnifying glass of three to ten diameters is useful for the examination of the parasites. The parasites should be placed in small vials (the one-dram homeopathic vials are a convenient size) of 70 per cent grain or denatured alcohol or 3 or 4 per cent solution of formalin for killing and preserving. Parasites from each individual bird should be placed in a separate vial, which should be labeled with the correct host-name, date, locality, and name of collector. It is also of value to give the band number of the host and to make a note on the banding record of the number of parasites collected as well as the approximate number still remaining on the bird. This affords an interesting record for comparison with future repeats of the host.

In order to determine the small parasites as to species they must be mounted on microscope slides and examined through a microscope. They are generally cleaned with potassium hydroxide before mounting in Canada balsam. Such a slide of a louse found on pelicans is shown in the accompanying figure (Fig. 1). The bird-flies are best studied on insect pins. Until so mounted they should be preserved in the dry condition in pill boxes packed with small bits of absorbent paper.

FIG. 1.—*Tetrophthalmus titan*, a louse from the pelican on a glass microscope slide. Showing method of mounting small ectoparasites for identification. Natural size.

Mr. S. Prentiss Baldwin and several others closely connected with bird-banding have expressed the thought that bird-banders in handling many thousands of birds can not only assist the entomologist in the collection of parasites but may be able to work out new problems in ornithology by studying the effects of the parasites upon bird life. It is with the idea of calling the attention of the bird-banders to these many new and interesting fields of study as well as to assist in identifying the groups of parasites found, that this paper is presented. Some details of the appearance, life history, habits, abundance, and importance are given for each group of ectoparasites commonly found on wild birds. The "Manual of External Parasites," by Dr. H. E. Ewing,[1] may be consulted for additional information if desired.

LICE

The most common parasites likely to be found on birds are the *Mallophaga*, or biting lice. All species of birds and many mammals harbor them, although not all individuals of a species may be infested. Those found on birds are small (most species being only 1 to 3 mm. in length), generally white, yellowish, or brownish in color, flattened, wingless, more or less active insects. They are well adapted to their parasitic mode of living, having claws for clinging to the feathers and skin, being flattened for easy locomotion through the feathers, and having biting mouth parts for feeding on bits of feathers and epidermal scales. They cause much irritation by their sharp claws and the rasping of their mandibles.

The biting lice spend their entire life on their hosts, seeming to require the body heat of the bird to remain alive. They never leave the host to crawl around on limbs of trees, on rocks, or in nesting material, although some may be shaken from the feathers by the bird in trying to free itself of these parasites. The complete life cycle of any one of the nearly 2000 species of Mallophaga described from the world has not been worked out accurately, but since the temperature of their habitat varies so little there are undoubtedly several generations during the year. The eggs, laid near the shaft or base of the feathers, hatch into nymphs which resemble the adults except in being much smaller and lighter in color. These nymphs shed their skins several times during their growth, each time becoming larger and more nearly the size and color of the adults.

[1]Published in 1929 by C. C. Thomas, Springfield, Illinois.

The lice are generally most abundant around the head, throat, and breast regions, and on the long feathers of the wings and tail. It is very interesting to find that the different genera are found in definite and quite different regions of the body of their hosts. The slow-moving, heavy-jawed, and clumsy forms are found almost entirely around the head, neck, and throat regions since they are not easily dislodged by scratching. The lice found on the breast, anal, or back regions are generally rapid-running forms easily able to escape the bird's scratching or picking. A slim and fast-running group is found on the long wing-feathers. It is therefore necessary to examine definite regions on the body of the host in order to find all the lice.

Each species of bird is generally found to have its own species of lice, although closely related host species may often have the same parasites. It would be interesting to know whether a species of louse peculiar to one species of host would live if placed on another species. No very accurate work has been done along this line. In nature a few cases of "straggling" are found, principally on small oceanic islands where land and water birds are often found resting side by side on the rocks, thus allowing an interchange of parasites during bodily contacts.

FIG. 2.—*Philopterus subflavescens*, a louse commonly found on many passerine birds. The dark mass in the abdomen is the crop filled with bits of feathers. X 17½.

Water birds, birds of prey, and large land birds seem to be most heavily infested with lice, while many individuals of the smaller passerine species are uninfested. Young birds are often found to have only immature lice, perhaps showing that the young lice are more active, thus seeking new hosts, or that they may be crowded from the host by the adults. A few collectors[1] believe they have found the life cycle of lice somewhat paralleling that of their host. They have found the lice mostly in the egg stage during the winter, many young lice in early spring, and many adults in late spring. Eggs deposited about the time the host is beginning to nest would

[1]Mr. M. B. Trautman, of Columbus, Ohio, first called my attention to this.

produce many young lice when there are young birds in the nest, thus allowing for migration and spread of the lice. This would seem to indicate only two generations a year—one for distributing the species, the other for populating the new host.

MITES

Mites are minute arthropods constituting, with the ticks, the order *Acarina* of the class *Arachnida*. They are distinguished by having four pairs of legs in the adult stage (three pairs in the larval stage), by being pale or somewhat red in color, more or less flattened, and by having sucking mouth parts, and an unsegmented abdomen broadly united with the cephalothorax. Mites are the smallest of the arthropods, yet they are exceedingly numerous and widely distributed, being found on plant and animal life, both vertebrate and invertebrate, as well as in the soil as free living forms. There are several kinds of mites found on birds, including especially the chiggers, itch mites, and feather mites. The first two groups named are very minute and almost impossible to observe and collect from living birds. Ground-inhabiting birds are an important factor in the distribution of the common chigger.

The mites most often observed on birds are called feather mites and belong to the family *Analgesidæ*. They are small (about 1 mm. or less in length), flattened, with the legs placed laterally and usually each ending in a sucker, and with pro-

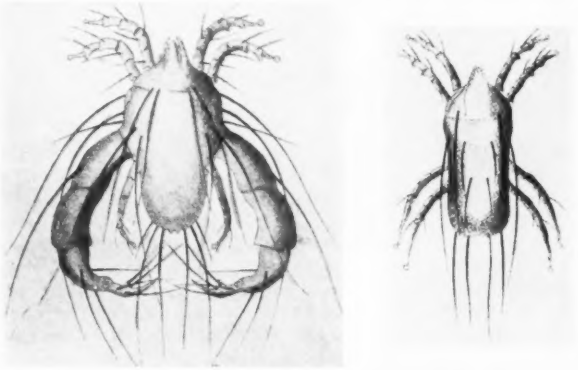

FIG. 3.—*Analges passerinus*, feather mite. Showing enormous development of the third pair of legs of male (left) in comparison to female (right). (After Ewing)

nounced sexual dimorphism, the male being the larger and in some genera having one pair of legs enormously enlarged for holding the female. They may be most easily seen crawling slowly along the barbules of the longer wing feathers. They have sucking mouth parts, but their feeding habits are not well known. The oblong, whitish, and very minute eggs are usually deposited end to end in rows between two adjacent barbs of the feathers. A migratory nymph may occur in the life history of some, and in most species a copulating nymphal stage precedes that of the adult female.

The family *Analgesidæ* is divided into four subfamilies, each of which is in turn divided into numerous genera. It is impossible to identify these very minute parasites without first mounting them on microscope slides for examination, and since there are so many genera no attempt will be made to give anything but the general characteristics of the subfamilies and some information as to where they may be found. The subfamily *Pterolichinæ* are rather robust mites found among the flight feathers of parakeets, birds of prey, gallinaceous birds, and certain of the passerines. The subfamily *Analgesinæ* includes forms found among any of the feathers except the long wing feathers of the host. They are not confined to any special groups of birds. The males may be much larger than the females and may have an enormous development of the third or fourth pair of legs. The subfamily *Proctophyllodinæ* infest the feathers of the wing, back, and flank of certain groups of land birds. They are forms in which the abdomen of the females is bilobed posteriorly and in which neither of the last two pairs of legs in the males is usually enlarged. The subfamily *Epidermoptinæ* include those which live next to the skin of the hosts. They are very small and not easily identified.

TICKS

The ticks constitute the superfamily *Ixodoidea* of the order *Acarina*. In the adult stage they are distinguished from the mites by a pair of stigmal plates situated laterally behind the last pair of legs, and usually by their larger size, ranging from 1 mm. in the larvæ to as much as 15 mm. in the fully engorged females of some species. The group is not large in species, there being less than three hundred species in some dozen genera, but in number of individuals it is one of the largest and most important groups of ectoparasites. Ticks are found throughout the world and on four out of the five classes of vertebrates, being more abundant on reptiles and mammals than on amphibians and birds, and they are more numerous in the tropics and subtropics than in the temperate regions.

Ticks are known to transmit blood-borne diseases of mammals and may carry some diseases of birds.

FIG. 4.—*Hæmaphysalis leporis-palustris*. A seed tick magnified about 20 times.

The most common ticks found on birds are *Hæmaphysalis leporis-palustris* and *Hæmaphysalis chordeilis*. They are found attached by their strong piercing and sucking beak to the skin at the base of the feathers on top of the head, around the eye, base of bill, and ear coverts of their hosts. They are generally of a red or brown color since they feed entirely on blood. The abdomen of the nymphs and females is capable of great distention, allowing a relatively enormous quantity of blood to be imbibed. The eggs are laid in one or more masses in the surface soil or under leaves or humus. The "seed ticks," or larvæ, hatching from the eggs, have only three pairs of legs, are very hardy, and able to go without food for many days. They generally climb up blades of grass and other low vegetation and attach themselves to the first host which comes along. After engorging, the larvæ fall to the ground and pass through a quiescent state while molting to nymphs. The nymphs have four pairs of legs. They attach themselves to hosts, engorge, and drop to the ground to molt to adults, which likewise attach and engorge. Thus it will be seen that three separate hosts are required in the development of the tick. Owing to their peculiar life history, ticks are usually found only on those birds living or feeding on the ground. The adults of *H. leporis-palustris* are seldom found on birds, seeming to prefer rabbits. All stages of *H chordeilis* are found on birds, although the adults are sometimes also found on small mammals. It is possible to find larvæ or nymphs of both species of bird ticks on the same host. A heavy infestation on young birds may cause their death.

FLEAS

Fleas are insects comprising the order *Siphonaptera*. They are small, laterally compressed, wingless, jumping insects with mouth parts fitted for piercing and sucking the blood of their hosts. The order includes about six hundred species widely distributed on birds and mammals. By far the greater number of species infest mammals, although many are found on birds.

They are parasitic only in the adult stage. The body is oval and greatly compressed, which allows them to slip easily and quickly through the narrow spaces between the feathers or hair of their host. Since they are greatly specialized for jumping they may pass readily from one host to another, either bird or mammal, and are not so restricted as are the

FIG. 5.—*Echidnophaga gallinacea*, the sticktight flea. X 25.

lice and mites. Some species may carry blood-borne diseases. They are known to carry bubonic plague.

The most commonly observed species on wild birds and poultry especially in the southern part of the United States, is the sticktight flea, *Echidnophaga gallinacea*, so called because it seldon hops from one host to another, as do most fleas, but settles down on one host, deeply inserts its mouth parts, and remains there feeding for days or weeks. It is a small (1 to 1½ mm.) dark brown species which may sometimes be found in enormous numbers or masses on the host, generally around the eyes, base of bill, and ear openings. The minute whitish oval eggs are laid on the host, but as they are not attached in any way soon roll off and come to rest in the nesting materials or other places which the host frequents. A slender, wormlike larva, without legs and having biting mouth parts, soon hatches from the egg, feeds on organic matter in the dust and debris of the nest, and, after reaching larval maturity, spins a small, thin, oval cocoon in which the pupal stage is passed. The adult emerges from the pupal skin after one to four weeks, and immediately seeks a host on which to feed.

Several larger species of fleas breed almost exclusively on

birds, and others may be found occasionally on birds. They may be easily overlooked since they do not remain attached but jump from their host when disturbed.

BIRD FLIES

The parasitic flies found on many birds and mammals comprise the family *Hippoboscidæ* of the order *Diptera*. Those found on birds are generally dark green or brown in color, five to ten mm. in length, greatly flattened, fast-running, and have one pair of wings. They are able to run sidewise through the feathers on the breast, back, and wings. When the feathers of the host are disturbed they may fly quickly from one bird to another and may even alight on a person handling their host. The adults seem to require the body heat of their host and spend practically their entire life on the bird. They cause great annoyance and loss of vitality by feeding on blood which they imbibe through their piercing and sucking mouth parts. They are known to transmit bird malaria and may carry other blood-borne diseases.

FIG. 6.—*Ornithomyia avicularia*, a common bird fly on passerine birds. Magnified about 6 times.

The *Hippoboscidæ* have a peculiar life cycle in that the egg hatches and the larva develops in the body of the female fly and is deposited as a full-grown larva in the nesting materials or even among the feathers of the adult birds or nestlings. This larva immediately pupates, and the adult fly emerges after several weeks or months, depending on the temperature and other conditions. Several generations a year may occur, but very few details of the life history are known at the present time. Some bird-banders have found the flies more numerous on juvenile than on adult birds, and most abundant in late summer or early autumn. *Ornithomyia avicularia* is a species found on many passerine birds.

Mr. C. L. Whittle, of Peterboro, New Hampshire, has found that these flies are easily collected if the birds are banded and examined indoors in front of a window. When the feathers are

disturbed, the flies immediately dart to the window pane, where they are captured by placing the mouth of a small vial over them.

CONTROL OF ECTOPARASITES

Some banders may be interested in the control and eradication of these ectoparasites from birds they are observing in connection with some special problem. Lice may be killed with a light dusting of derris powder or sodium fluoride among the feathers of the bird. This powder may be applied in several "pinches," the quantity which can be held between the thumb and forefinger, inserted among the feathers at several places on the body of the bird, such as among the breast feathers, on the back at base of tail, and some under each wing. Fleas are easily controlled by dusting their hosts with fresh pyrethrum powder to kill the adults and by spraying their breeding places with creosote oil to kill the eggs, larvæ, and pupæ. Feather mites may be killed by dipping the host in a solution of sulphur, soap, and water, using two ounces of sulphur and one ounce of soap for every gallon of water. They should be dipped only on warm sunny days. Ticks and bird flies are best controlled by picking them from the host with small forceps.

CONCLUSION

Bird-banding has opened a new avenue of approach for the study of the ectoparasites of birds. The bander has an opportunity to study the parasites and their effect on the habits and reactions of the living bird, an opportunity which is not so readily available to the entomologist. This is a field of study which bird-banders have as yet scarcely touched, the possibilities of which it would be impossible to estimate. It is to the bird-bander that we must look for much information on the life histories of the parasites and their effect on the bird, and it is hoped that this paper will suggest some interesting problems as well as aid in the identification of the larger groups of ectoparasites.

The Bureau of Entomology will be glad to identify ectoparasites and assist the banders as much as possible in solving any problems involving ectoparasites. The bureau would also be glad to receive specimens of ectoparasites to aid in building up its collection and to receive any information which may aid in studies of the life history, host relationships, and classification of the parasites. Specimens may be addressed to the Bureau of Entomology, Washington, D. C.[1]

[1]Specimens and mail should be addressed directly to Mr. H. S. Peters at the Bureau of Entomology, Washington, D. C., in order to facilitate and hasten replies. Mr. Peters will send small vials of preservative to banders willing to collect and send him specimens for identification and for the collection of the Bureau of Entomology.—*The Editor.*

THE NEW STUDY OF BIRD BEHAVIOR[1]

By HERBERT FRIEDMANN

IN the foreword of a recent scientific journal the editor made a simple and direct statement to the effect that his new periodical was to be dedicated to the publication of the results of original research, *including thinking*. It requires no great depth of insight to see that he was reacting to the inevitable boredom of the vast volume of papers containing much accurate and valuable matter, but which were individually and collectively without any point, and consequently, devoid of immediate significance. His reaction is a timely one and may well be applied to that branch of science that deals with birds. In ornithology the need for accurate descriptions not only of the birds but also of their habits and their habitats, and for careful delineations of their distribution in space and time, appears to be still the central theme to the majority of students, and the result has been that we are in possession of vast quantities of data of several sorts, but have almost nothing in the way of what, for want of a better term, may be called the logic of ornithology. The idea that science consists of an orderly arrangement of tried and tested facts put together like the bricks of a building is a false one. The important thing in any science is its theory or system of logical concepts by which the facts involved are grouped so as to be mutually clarifying and suggestively helpful in current research. In other words, if we may return to our simile of facts and bricks, science without its theory would be like a building without a plan. The architect is more important than the bricklayer, although each needs the other to make a solid and enduring structure.

In no phase of ornithology has there been placed on record a larger quantity of disconnected facts and observations than in that which deals with the life histories and habits of birds. Numberless observations have been recorded merely because they were easy to record; others, less obvious at first sight, have also been published, but practically all of them involve merely the use of the five senses and betray little sign of the cogitative faculties of which those senses are the feeders of raw

[1]Being a review of H. Eliot Howard's *An Introduction to the Study of Bird Behaviour*, Cambridge University Press, 1929, pp. xii—136, 10 plates, 2 maps, price 42 shillings.
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materials. The plain truth of the matter is that until very recently the great majority of bird-students did not know how to think in the cold, dispassionate manner so essential to scientific progress. They were bird-lovers, not bird-students. Fortunately, the distinction between these attitudes has manifested itself in the last few years, and many students of the living bird have divorced sentiment from reason and have really begun to direct their observations along definite lines instead of simply observing casually for the pleasurable sensations they derived. The great growth of bird-banding is one of the most significant results of this new attitude. Another important outcome has been the increasing number of detailed life history studies in which all the habits of a single species are correlated and shown to be possessed of a certain continuity or in which obscure habits of groups of species are made more understandable and their origin and development rendered less mysterious.

Years before most students of birds even began to realize the need for correlating their heterogeneous data, a lone worker in England became convinced that to understand the true meaning of any part of the sum total of habits of any bird, it was necessary to piece together carefully the entire life history of that bird, as the individual parts were of significance only in so far as they contrbiuted to the whole picture. That man is the author of the book here under review. Between the years 1907 and 1914 H. Eliot Howard published his sumptuous two-volume work on the British Warblers, an intimate study or history of these birds from the point of view of their problems in life. In this important work the now familiar idea of the breeding territory first took definite form. Following his studies of the Warblers, Howard then concentrated on the problem of "territory" as such; its relationship to such other topics as song, display, and migration being nicely set forth in his book "Territory in Bird Life," which appeared in 1920. Now, after an interval of nine years, he breaks his all too prolonged literary silence and brings to our attention the results of his continued researches. This book, modestly titled, "An Introduction to the Study of Bird Behaviour"is,in the opinion of the present reviewer, the most important and significant interpretive study of avian life ever made in any country, and the fact that it is based very largely on two common birds of the English countryside serves to reveal the unbounded wealth of material and opportunity for research available close at hand. Far too many ornithological investigators (whose science is extensive at the expense of

depth) appear to feel that it is necessary to go to the remotest parts of the world in order to obtain results of value. In certain lines of work this is true, but if science is to be an effective scheme of thought, it must have the depth that comes from intense application and that never can accrue from fragmentary studies of great numbers of species.

In writing this paper the reviewer has attempted a summary of Howard's book three different times, and each time the result was different and each time it was woefully insufficient. Some have criticized Howard's previous works as being "wordy," but in the present instance each word, each phrase, each sentence is so necessary to the argumentative coherence of the whole that it becomes well-nigh impossible to do the book justice without making the review almost as long as the book itself. This is wholly understandable to any one who has read the book, as it is in itself a summary and a review of a very prolonged period of reflectful and intelligently directed observation. Every person interested in understanding the lives and actions of any birds in particular or of birds in general, simply must read and reread and ponder over this remarkable book. No review can be sufficient in this case. For the benefit of those whose interests lie more in other lines the following inadequate words will have to suffice.

The general problem discussed in Howard's book is the behavior of birds during the breeding-season, commencing with the earliest inception of the territorial reaction of the males, before the females have arrived or are in condition to respond, and continuing until the young are fully fledged and are able to care for themselves. To quote from his introduction, we note that "the behaviour of a bird during the breeding season is determined by reactions peculiar to that season; and since these reactions only function in response to stimulation provided by the external world, it is manifest that we must regard a bird with its environment as an organic whole. We can study life and we can study environment but we must not divorce them if we are to study behaviour. True, we can take any one reaction and study it by itself and learn something about its mechanism, but we can learn nothing about its utility or value for that depends upon other reactions which minister to it and to which it ministers. One reaction in itself is neither more nor less important than another; each forms a portion of the environment for others; each is sensitive to the modification of others—they form a constellation, and somewhere in the organization of the living bird they have a common structural link. Hence I speak of a neurally linked pattern of events within that organization."

Howard begins by presenting to his readers detailed accounts of the behavior of two familiar birds, the Reed-Bunting and the Yellow Bunting. These accounts are not only beautifully presented illuminating descriptions of the natural history of these forms, but present the factual basis for much that is to follow. However, these two particular species are merely random examples, and are not chosen because of any peculiarities they may possess. The behavior of the birds during the total period of reproductive activity is shown to be divisible into four phases. The first of these is noticeable only in the males and results in the establishment of individual breeding territories. The change in behavior is chiefly a change from gregariousness (winter flocking) to a preference for solitude. It also manifests itself in the beginning of song, which, of course, is associated with, and only given in, the territory of each male. The second phase begins with the arrival of a female in proper physiological condition to stimulate the actions of the male and to be stimulated by it. The behavior of the male changes—he remains more and more within the limits of his territory; the song reaches its climax of perfection. The most characteristic symptom of this phase is, however, the sexual flight in which the male pursues the female in a mad, frenzied flight which is almost unbelievable in contrast to the total indifference exhibited only a few days earlier in the first phase. The first indication of nest-building on the part of the female ushers in the third phase, which lasts through the period of nest-building and egg-laying. During this phase the male stops singing, either entirely, or to a very large extent. The fourth phase covers the period of incubation and care of the young. The male may start singing again, and the female acts (aside from caring for the eggs and young) much as in the second phase. This may be looked upon as a preliminary to a second cycle telescoped on to the end of the first in two-brooded birds, but it lacks the pristine freshness and poteney of the first one. All in all, we have here spread out before us a panorama of consecutive events based on an inherited nervous pattern, and which are released into expression through internal changes as well as by external causes. Each act occurs in a definite relationship to other acts which precede or succeed it, and all occur with the certainty and rapidity of reflexes; the responses are in the form of reactions and, when interrupted by accidental or other agencies, they exhibit an almost bewildering diversity of conditioned responses, which are otherwise completely hidden by the normal course of events. The intensity of the reactions is shown to be

dependent to some extent on external conditions, especially temperature and atmospheric pressure, and also on internal stimuli—hunger, fear, etc. The intensity is generally greater in the male, but this appears to be largely due to the fact that the physiological control of reactions is stronger in the female.

After displaying the habits of the Reed-Bunting and the Yellow Bunting for the edification of his readers, Howard then proceeds with an analysis of their behavior, as is inadequately traced above, and then dilates on his main theme, that the whole story has a biological value and significance that far exceeds a mere summation of its component parts. In fact, he goes to the extent of calling his fourth chapter "The Whole has Value, the Parts by Themselves have None." It is hopeless to attempt to summarize this part of the book. By a masterly grouping and regrouping of his apparently heterogeneous data, by focussing on them the light of recent advances in comparative psychology, first from one angle, then from another, the author leads his readers along an intricate path of the most searching sort of psychic analysis and is able to show that nothing is casual, that all reactions are dependent on what has gone before or is happening simultaneously, and that what appeared to be diverse modes of behavior are merely isolated elements, the fusion of which in different quantities and degrees at different stages of the reproductive season may account for the observable discrepancies in behavior. It is in this chapter that he takes us far beyond the limits reached in his earlier works. It is a great tribute to the zeal, intelligence, and ability with which he has so patiently worked out the interrelationships between a host of specific behavioristic elements, that the result is one of the few works in which a psychologist (for Howard is preëminently an avian psychologist) is able to convince a biologist that the methods and results of the "mind science" are coequal in value with those of the "life science."

With an achievement such as this most writers would be satisfied to pause, but not so our present author. Having established the coherence, the cause-and-effect relations of behavior, he goes still farther, and asks himself if, with the rich harvest of new materials and of deeper understanding that he has acquired, it is not admissible to attempt to view the same story (the behavior during the reproductive cycle) through the now possible synthesis of his facts; in other words, to view the subject not from the point of view of a human observer, but from that of the bird itself, reconstructed by aid of an intimate knowledge of its psychic functionings. The

last chapter, "An Approach to a Mind Story," is the result. While it is, on the whole, less satisfying and convincing than the preceding chapter, it is, nevertheless, a very thrilling piece of writing. Most of us have imagined, at least as children, how interesting it would be if we could talk to animals in their own language and think as they do. That childish dream comes nearer to fulfillment in the last thirty pages of Howard's text than anywhere else in the experience of the present reviewer. To read it (and it must be read slowly and attentively like the rest of the book) is an intellectual adventure of the highest order. We get out of our own skins more completely there than anywhere else in the whole range of ornithological literature, and on turning the last page return to ourselves richer in having been away for a brief period.

The book is very handsomely gotten up and is illustrated by ten beautiful plates in black and white after drawings by G. E. Lodge.

Any review is expected to point out the flaws as well as the merits of the work it deals with. The main fault with the present book is its expensiveness, which may limit its circulation among bird-students. Bird-banders may well wish that Howard had banded his birds to be sure of their individual identity, but this is a rather minor matter, as his results show clearly that he is an uncommonly keen and accurate observer. His use of the mammalian terms of œstrous, proœstrous, and posœstrous in connection with birds may be objected to on rather good biological grounds, and the argument biologists habitually hold forth against psychologists that there are insufficient physical data in the work of the latter may also be applied, but all of these are ungracious, to say the least, in consideration of the great work Howard has done.

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SOME SECONDARY RESULTS OF BIRD-BANDING

By O. A. STEVENS

BIRD-BANDING is yet so new a study that it is perhaps too soon to state the primary objects, unless we accept what has first been suggested. The first idea, no doubt, was to learn whether the birds would return to the same place another year. This was followed by questions relating to length of life, winter habitat, plumage-changes, mating-habits, local range, etc.

I believe that the chief idea in my title is that the increased observation which comes from regular trapping produces a number of incidental results. I have kept rather sketchy migration-lists for many years, as I suppose thousands of other people have. These records came from the daily house-to-office walk of half a mile in the outskirts of the city, supplemented by a weekly hike in the surrounding country and by frequent half-hour or hour morning walks about the campus and gardens. How often I realized that these gave only glimpses of the passing review, and wished for time to make the weekly trip a daily one! Regular attention to a line of traps through the gardens has provided such an opportunity but with restricted range.

Trapping has distinctly extended the migration dates, both through closer observation and through birds captured. The trap, to be sure, cannot be depended upon to secure the first arrival, but it is constantly ready and has more opportunity than the eye, which is present for only brief periods. Sometimes the first or last record is a bird seen during the rounds, but very often it is a captured bird, and not infrequently one which might have been questioned without positive identification. Trapping has given me definite expression of the abundance of certain species in different seasons. It has furnished a much better idea of the abundance of the Fox Sparrow, and has shown that the White-crowned Sparrow is more common here than I had thought, most of the specimens, however, being the Gambel's subspecies.

Tree Sparrows have been rare birds in my traps; so it was a double surprise to take one on September 30th this year, two days earlier than I had recorded it before. Last spring at Jamestown, North Dakota, Mrs. A. W. Guest captured a Harris's Sparrow three weeks in advance of their usual arrival. My own fall arrival records of Harris's Sparrow are interesting. They began in 1922, and the first years ran: September 29, 25,

28, and 22. With trapping they became: September 19, 18, 16, and 15.

The recording of the first or last bird is of less importance than finding the dates of the principal movement or of the individual "waves" during the migration. Here regular trapping serves indirectly by observation as well as directly by its results. The latter point has been discussed in some detail by Mr. J. T. Nichols; so I can scarcely claim its discovery. The value of regular trapping during migration will bear repeated emphasis. The lean days are just as important as the fat ones, and days when no trapping is done must be carefully noted. General observations are essential to confirm and interpret the results. Repeated removal of those individuals which form the trap habit becomes tiresome, but the preservation of all records is needed to make the results as useful as possible.

The great majority of trapping stations may be limited in their scope and unable to take migrants in large numbers. The work of these stations is none the less valuable. Intensive work with a small number of resident birds should produce relatively large results. For those who have the opportunity the quantitative study of migrations presents an important field. Attention may be called to the fact that the appearance of migrants in unfrequented places is most likely to occur during their greatest abundance. The Junco migration covers a long period, but the principal period is short. We had observed that few appear in our backyard except when they are present in large numbers. In the spring of 1929 they visited the yard in numbers only from April 7th to 13th, though the whole period extended from March 17th to May 12th.

When one attempts to present such results graphically, he is likely to be surprised at the quantity which is needed to make a satisfactory picture. It may be worth while at times to use the combined results from different species. A year ago I became interested in tabulating my results in the following manner. These include all species, but Harris's and White-throated sparrows are very predominant.

TRAPPING RESULTS AT FARGO, NORTH DAKOTA IN 1929

Sept.	13	14	15	16	17	18	19	20	21	22	23	25¾	29	30
New birds banded	6	9	20	19	17	11	14	5	6	8	11	32	28	32
Old birds repeating	1	2	5	3	10	12	11	17	15	22	15	7	7	13
New birds repeating	1	0	3	3	1	1	0	0	1	1	1	2	0	4
Duplications	9	1	1	2	4	7	6	13	12	20	9	7	3	8
Total	17	12	29	27	32	31	31	35	34	51	36	48	38	57

Oct.	1	2	3	4	5	6	7	8	9½
New birds banded	35	36	14	14	39	31	19	11	2
Old birds repeating	20	32	14	21	22	12	15	12	17
New birds repeating	5	5	3	3	2	8	5	1	2
Duplications	15	34	20	26	31	24	22	12	7
Total	75	107	51	64	94	75	61	36	28

This record is continuous and regular except for a period of wet weather which caused an interruption on September 24th and before the end of the day on the 25th, until the 29th. An other interruption occurred October 9th to 12th, and, as shown by previous years, this is about the close of the main migration period, except for the Juncos.

These figures show a number of things. It is interesting to note that only about 12 per cent of the total number repeated the same day that they were banded. (Approximately 50 per cent of all Harris's and White-throated Sparrows repeated in the fall of 1928, 37 and 47 per cent respectively in 1929.) Birds entering the traps more than once a day have furnished about one third of the total number of records. The number of repeat records best indicates the migration movement, a large number always occurring the day before a departing flight. Such periods are shown in the above table on September 22d, October 2d, and October 5th. October 2d was remarkable for the number of new birds banded (all Harris's Sparrows) almost none of which reappeared. This I interpret as unusual activity in feeding rather than arrival of a new group. The largest number in 1928 was on October 1st.

The general tendency seems to be for the numbers (especially of individuals repeating) to increase until the departure of a group. The rainy period October 9th to 12th was without any marked drop in temperature. More than half of the birds taken on October 9th reappeared on October 13th. The next two days were warm, but a cool north wind blew for a while in the afternoon of the second day. The following day was pleasant again, but practically all the birds had gone.

Truly, bird-banding has opened an enormous field of activity. It offers an opportunity of intimate contact which had been lacking. Great as are the possibilities of obtaining through it scientific knowledge, my belief is that the largest returns will be to the workers themselves through the pleasure of a more intimate acquaintance with, and deeper appreciation of our feathered friends.

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DO BIRDS USUALLY CHANGE MATES FOR THE SECOND BROOD?

By MARGARET MORSE NICE

WE used to think that most birds mated for life; now we read in a recent book that "probably the majority of passerine birds change mates for the second brood." My experience did not support this statement; so I was moved to a survey of recent literature to find what bird-banding has to say on the subject. The results follow; in every case the birds were banded.

	CHANGED MATES FOR SECOND BROOD	
Brown Thrasher	1 pair	Perkins, S. E. 1928. *Bull. Northeastern Bird-banding Assoc.*, IV, pp. 153-154.
House Wren	3 pairs	Baldwin, S. P., 1921. *Auk*, XXXVIII, pp. 237-244.
	1 pair, 2 seasons	Baldwin, S. P., and Bowen, H. B., 1928. *Auk*, XLV, p. 194.
Bluebird	Male had different mate for 2d brood, but returned to 1st mate for 3d brood.	Pontius, F. D. 1928. *Ohio State Mus. Sci. Bull.* I, p. 75.
	SAME MATES THROUGHOUT SEASON	
Phœbe	1 pair, 2 seasons	Higgins, A. W., 1926. *Bull. Northeastern Bird-banding Assoc.*, II, pp. 81-82.
Chipping Sparrow	1 pair	Whittle, C.L., 1925. *Auk*, XLII, p. 136.
Field Sparrow	1 pair	Pontius, F. D., 1928. *Loc. cit.*
Junco	1 pair	Smith, W. P., 1928. *Bull. Northeastern Bird-banding Assoc.*, IV, pp. 137-141.
Song-Sparrow	2 pairs, 2 seasons	Hamil, Mrs. L. C., 1926. *Bull. Northeastern Bird-banding Assoc.*, II, pp. 7-10.
	1 pair, 2 seasons	Higgins, A. W., 1926. *Bull. Northeastern Bird-banding Assoc.*, II, p. 39.
	2 pairs	Nice, M. M., 1929. In Columbus, Ohio.
Towhee	1 pair	Boggs, M. A., 1926. *Auk*, XLIII, pp. 242-244.
Cardinal	1 pair	Nice, M. M., 1927. In Norman, Okla.
Catbird	1 pair	Whittle, H. G., 1925. *Bull. Northeastern Bird-banding Assoc.*, I, pp. 48-49.
	1 pair	Perkins, S. E., 1928. *Loc. cit.*
House Wren	1 pair	Baldwin, S. P., 1921. *Loc. cit.*
Robin	1 pair	Nice, M. M., 1929. In Columbus, Ohio.
Bluebird	1 pair	Higgins, A. W., 1925. *Bull. Northeastern Bird-banding Assoc.*, I, pp. 2–4.

Thus in the case of seven pairs of three species there was a shifting of mates in one season, while in twenty pairs of eleven species there was no change.

Both House Wrens and Bluebirds leave the nesting-site for a time after one brood makes its first flight. In Oklahoma our pair of Bluebirds disappeared with their young from our grounds for periods of 9, 10, 14, and 16 days before returning to start the second brood; on one occasion a battle was staged between two females at the beginning of the second nesting. It will be noted that both these species at times keep the same mates. Possibly there is some correlation here with the stage of development at which birds leave the nest: House Wrens do so at the age of about 14 days. Bluebirds at 16 to 18 days, while Field and Song Sparrows, Juncos, Towhees, and Cardinals remain only 9 to 11 days, and Robins 13 to 15 days. The first two species are doubtless better able to fly when they leave home than the others.

Brown Thrashers seem rather definitely to make a new start for the second brood, for the male resumes singing for a few days at this time. In the instance where a pair changed mates, there was a long interval between the dates given for the first and second broods—May 19th and July 14th and 20th—while the broods of the faithful Catbirds were banded June 6th and July 11th.

With the three species of banded birds I watched there was a different situation, for the nesting cycles overlapped. The Robin started her second nest six days after the young had left the first, and the male was still feeding them eleven days later. In three and a half months this pair raised three broods successfully. The female Cardinal built her second nest while the first brood were still in the first nest; her mate fed his elder daughters two days after the younger birds had hatched. In both pairs of Song Sparrows the females turned their attention to nest-building a few days after the young had left the previous nest: one, three days later, the other six, and the last time only two days after this event. The females fed the young to some extent while building, but the males took the major part of their care, feeding them nearly up to the time the next broods hatched. In these cases where a new cycle is begun while both parents are actively engaged in caring for their young, seeking of new mates is out of the question.

Other instances of the overlapping of nesting cycles have come to my attention. A striking example is that of the double nest of a Bell's Vireo (G. W. Morse, 1927. *Oölogist*, XLIV,

pp. 23-24.) in which the second nest was built two thirds of the way around the first and contained two eggs when the young of the first brood were nearly ready to fly. I have seen a Migrant Shrike alternately feeding her fluffy brood recently out in the world and carrying bits of her old nest to a new site seventy-five feet distant, and I have watched a Magnolia Warbler, a Blue-gray Gnatcatcher, and a Yellow-crowned Night Heron each courting his mate before the young of the first brood were out of the nest.

The other factor that makes for stability is the matter of the territory. After the birds have thoroughly established their habits of confining their activities within certain limits which mean home to them, of following certain routes and avoiding others, and of considering their neighbors their enemies, it seems unnatural for them to change all these reactions and wander to a new territory to find a new mate. Although one of my Song Sparrows built her fourth nest in the territory of the neighboring pair, there was never the slightest indication of change of relationship between the pairs, each of the four birds showing constant hostility to both male and female of the other pair.

To sum up, I do not believe that birds ordinarily change mates within a season unless each nesting-cycle is more or less of a closed circle, probably involving a desertion of the territory near the end and subsequently a definite new beginning.

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OBSERVATIONS OF THE NESTING ACTIVITIES OF THE HERMIT THRUSH

By OLIN S. PETTINGILL, JR.

(With three photographs by Alfred O. Gross)

NOT long ago a part of the shore and vicinity of Douglas Lake in northern Michigan was swept by fire, resulting in the loss of a well-timbered forest. Among the avian settlers to the devastated area were a surprising number of Hermit Thrushes (*Hylocichla guttata pallasi*). Here, unprotected by a heavily wooded territory, where many people believe their habitat to be, these birds made their home. Of the six nests found in an area of a square mile, one was located not a hundred feet from the shore of the lake itself. Few trees grew in the neighborhood of this nest. A quaking aspen partially shaded it;

a cluster of three gray birches offered the only protection from man's intrusion, while scrub blueberry bushes and bunchberry plants overhung the rim of the nest, and occurred as well in many other places throughout the burned locality. Several juneberry trees were scattered here and there, and a wooded swamp lay in the opposite direction from the lake.

It was in this setting that the domestic routine of the Hermit Thrush was carried out before me. Five feet from the bowl of the nest a burlap blind was erected. My first visit as well as my first observation of this bird at home began under the cover of darkness. I could not refrain from being a little excited that morning when I crept on hands and knees from the boat on the shore to the interior of the blind. My notes read: "The Hermit is present although at a glance by the aid of a flashlight I can scarcely distinguish between bird and ground. A white patch just visible about the throat is the only evidence of its presence. A careless movement on my part causes the blind to vibrate, and then a whir of wings! Dark as it is, this has proved too much for the Hermit. Four minutes elapse, and then there is a rustle among the leaves, followed shortly by several more. I can see a near-by blueberry bush swaying with an unaccustomed burden. A gust of wind moves the burlap, the beating wings fade into the distance, and then return becoming louder and louder. The Hermit can be seen circling the nest on wing, suspended in hummingbird fashion. Finally it alights on the ground and cautiously steals on to the nest.

"Ten minutes have passed and now daylight has come. To my surprise two Hermits are outside. One is perching while the other slowly nears the nest. A muffled *pweet, pweet* comes from both at various intervals. Suddenly the one in a juneberry tree drops to the ground and begins to scratch the leaves, twigs, and soil from one particular spot, where a grub is found and eaten. Meanwhile its mate has flown to a near-by tree. The first bird approaches the nest, giving several stiff-legged hops, hesitates a moment, and then hops a little nearer. This method of approach or traveling reminds me of the Robin's similar habit. On the edge of the nest the bird hesitates and looks carefully about the place, as well as examining the nest itself. A shove here and there with the bill after stepping into the bowl puts the eggs in the desired position and rolls them at the same time. An interesting and yet common performance among many species of birds follows, —the process of adjusting the eggs to the body by moving the breast back and forth over the upper surface of the eggs. In

Characteristic Position of the Bird When Covering the Eggs. Note the Crossed Primaries with the Tail at One Side.

so doing the breast feathers are worked aside, enabling the bare surface of the breast to come in direct contact with the eggs. Six periods of this 'rolling of the body' take place before the bird is finally settled. The raised feathers of the neck and back slowly fall to their natural position. The tips of the primaries are crossed over the rump, and the tail instead of lying in the plane of symmetry, lies on the right side of the crossed primaries. (See photograph.) The bill is pointed slightly upward. I note that the mate of the incubating bird has disappeared while my attention has been diverted by the activities on the nest."

The tail of the Hermit Thrush plays an important role at least from the standpoint of human observation. Its reddish-brown color serves as a dependable mark of distinction from the rest of the genus *Hylocichla*. To me the sudden raising and slow lowering of its tail to a natural position is an indicator of external activities. For instance, if I caused too great a commotion within the blind, the movement of its tail increased greatly, followed by a *chuck, chuck*.

A Nest of the Hermit Thrush in an Unusual and Picturesque Setting

The Hermit Thrust at noon day seemed more restless than at any other time of the twenty-four hours. Possibly this was due to the excessive heat. There was never, however, any quick movement of the body while the bird was on the nest, and even the head was always moved slowly. The brooding bird would adjust its eggs many times during the day uttering at the same time a succession of smothered *quit, quit* notes. The approach to the nest was always on foot in a series of three to seven hops with a few seconds of hesitation between, lengthened according to the amount of disturbance about the nest. At first I believed the blind to be the cause of this characteristic coming and going, but after two days of its presence, the Hermit continued in the same way, even following the side of the blind to the nest. I was always able to make as much noise as I liked while in the blind, but once let the least motion be visible through the burlap, and away went the bird.

Non-human intruders to the vicinity of the nest were not infrequent. Ants in droves crawled into my lunches, over me, and even to the top of the blind. The Hermit would casually peck at them from the nest. Once, during a noon hour, the bird flew from the nest giving its alarm-notes and fluttering. A young garter snake appeared suddenly from under the dead leaves near the nest. The parent bird manifested concern by hovering over the unwelcome guest in a defensive attitude and voicing *quit, quit* notes in rapid succession. One day a Slate-colored Junco alighted among the three aspens, and it was immediately driven away by both Hermits, which chanced to be near-by. My own approach by day was received with no great alarm except by a dash from the nest and several distress calls.

Of all my visits with the Hermit Thrush there was one morning which I shall never forget. In the home of the Hermit Thrush an important event was taking place. My notes, incomplete to a certain extent, as I was unable to write down occurrences fast enough, read: "I observe that the eggs are hatching. A bird takes a piece of egg-shell in its bill and flies away. Two youngsters are wiggling helplessly in the nest. After three minutes the bird is back with a small larva, barely visible at the tip of the beak. The new nestling is fed. Three more minutes elapse and the parent is back with a small may-fly. After another three minutes more food is brought, but this time I am unable to identify it. The Hermit fails to make the nestling respond at first; so it pecks at it gently. The bird broods after an interval of nine minutes. She (I assume the bird is a female) takes great interest in what is going on beneath her (see cover picture). She picks now at the last egg, removes a part of the shell, and devours it. She cranes her head over the edge of the nest to get a better view of a passing bird. She seems far more alert to-day, no doubt owing to her increase in domestic cares. Again she leaves, taking with her the last bit of egg-shell, returning shortly with a small larva. The nestlings this time do not respond to the approach. She beats her wings on the edge of the nest to arouse them. They shoot their heads up promptly, but are unable to hold them up for long as they are very weak. The last of the three to hatch is fed eighteen minutes after the breaking of the shell."

The process of rearing the young was a source of great interest. Both of the birds took part in this domestic duty, but at no time throughout the entire incubation period did I see the two birds together about the nest. The only way in which I was able to distinguish one bird from the other was by

means of the variation in the mottling on the breast. Often while one parent fed from the edge of the nest, the other, which I believed to be the male, arrived with additional food. Instead of waiting for the bird on the edge of the nest to leave, he merely "billed" over the food to his mate who fed the young. On other occasions I had what I considered a good opportunity to see the difference between male and female as to their judgment in regard to the quality and quantity of food. For instance, I saw one bird arrive and delicately place a mayfly or a small spider in the throat of a youngster. Immediately on the departure of this bird the other arrived with a green caterpillar an inch and a half in length and vigorously started to thrust it down the gaping nestling's mouth. The first attempt being a failure, he tried it a second time, and so on, making each push stronger and stronger until the bedraggled worm fell to the bowl of the nest, the nestling appearing tired out. The parent bird then swallowed the larva and flew off again to search for food. Once this same bird brought a salamander two thirds as long as the nest was wide, but it was not fed to a young bird.

So, through the long periods of observation, with plenty of entertainment and interest, I have made the acquaintance of this famous songster. The song of the Hermit Thrush rivals all other bird-songs in beauty and I believe surpasses the powers of human imitation. That flute-like song of a late afternoon and early evening in summer is no less beautiful to me for having been at home with its maker.

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A POSSIBLE MIGRATING FAMILY GROUP

By WENDELL P. SMITH

ONE of the problems awaiting solution and one which affords an unusual opportunity for bird-banders is that of the group habit. Perhaps it would be better to say a series of problems connected with the group habit, for a number of interesting lines of investigation are involved.

An explanation of the term and a summary of present knowledge concerning it may be helpful to an understanding of the contents of this paper. The phrase "group habit" was used by S. Prentiss Baldwin to describe the behavior of a group of White-throated Sparrows (*Zonotrichia albicollis*)

wintering at his banding station in Thomasville, Georgia.[1] This group was found only within a narrowly circumscribed area, and this area was occupied during several winters. A high percentage of returns were taken from this group, suggesting that some continuity of association existed among its members after departure from their wintering-grounds, as it would be difficult to explain the presence of an individual in subsequent seasons at a definite place in company with approximately the same number of individuals of the same species, many of these also returns, unless some degree of association existed through the remainder of the year.

Other observers have noted similar behavior both in this species and in others, especially among Tree Sparrows (*Spizella m. monticola*), and the Slate-colored Junco (*Junco h. hyemalis*). Charles L. Whittle,[2] both independently and in collaboration with Laurence B. Fletcher,[3] has made extensive investigations of this habit and outlined its possible biological significance.[2] Much, however, remains to be learned, and opportunities exist for banders at winter banding stations, for those who can operate stations within the breeding areas of these species, and for those who can trap migrants.

Any details of the origin of the group habit—how the group is formed, whether a family or combination of families, or whether some other factors enter into its formation—are of value, and when a sufficient number of these have been accumulated, the problem will be solved. Facts relating to the life-histories of birds come only through careful observation, and this necessitates the keeping of detailed daily records. These should include everything taking place about the station, regardless of any apparent significance at the time, for seldom does the discovery of an interesting fact come suddenly, but more often as the result of intensive work carried out through a longer or shorter period of time.

The following observations are offered, not in support of any theory of the origin of the group, for it would be impossible to do so upon the basis of an isolated fact, but as a suggestion of the origin of this habit in the given species, as a stimulus to further investigation, and as an illustration of the way in which facts are frequently ascertained.

During the fall of 1928, a number of White-crowned Sparrows (*Zonotrichia l. leucophrys*) visited my station at Wells River,

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[1] *Auk*, Vol. XXXVIII, No. 2, pp. 236-237.
[2] *Auk*, Vol. XL, No. 2, pp. 224-240.
[3] *Auk*, VOL. XLI, No. 2, pp. 327-333.

Vermont, and were banded. In the four-day period of October 10th–13th bands were attached to seven individuals of this species in the following order: No. 635385 to an immature bird on October 10th; Nos. 635386 and 635388 to birds of the year on October 11th; Nos. 635389 and 635390 to young birds on October 12th; and Nos. 635393 and 635395 to adults on October 13th. In addition to these an immature bird escaped from the trap unbanded.

The mere record of these birds is without significance, but field notes for this period showed that a flock of about eight White-crowned Sparrows were frequenting the trap-area and its vicinity and that these birds were behaving as a unit. It was noted that whenever an individual was alarmed a call-note communicated alarm to the other members of the group and that they together took wing and, after flying a short distance, alighted in close proximity to each other. Whenever an individual entered a trap it was accompanied to the immediate vicinity by the remainder of the group, and at times several individuals would be in the trap at the same time. Field observations of the age relationship within this group tallied closely with the banding-records. We would emphasize a detail always recorded in the banding-records and that is the time when the bird was taken. This is always done, regardless of how many times a bird may repeat, and in this way the association of these individuals received additional proof. Members of the group ceased to repeat on October 14th and apparently disappeared on the 16th.

We would not claim too much for the incident but we feel that the presence of six young and two adults of this species in a group probably several hundred miles south of their breeding-gounds is more than a coincidence and is suggestive of the continuance of the family bond through the southward migration. Further observations are needed to prove or disprove the accuracy of this, and we await with keen interest their accumulation, for it is from studies of this character that the bird-student derives his greatest pleasure. The lure of the unknown has no equal in power to awaken and sustain interest. Every bird-bander is confronted by the unknown if he will but realize it. He has within his reach the possibility of a never failing source of pleasure and satisfaction if these latent opportunities are improved.

Wells River, Vermont.

GENERAL NOTES

Trap-shy House Sparrows.—In the winter of 1923-24, I banded several House Sparrows at Garden City, Long Island, N. Y., cornered, by chance, in a pigeon-enclosure from which they could not readily escape. Although no attempt was made to retake these birds, for a couple of years thereafter I made occasional observations on banded sparrows about the place with a bearing on certain interesting problems, and had it in mind to follow these problems up by banding and trapping at some favorable opportunity.

There is a good deal of loose feed about for poultry and pigeons, and in January, 1930, the flock of House Sparrows frequenting the premises probably numbered upwards of one hundred. A wire sparrow-trap was obtained (with the kind assistance of Mr. W. I. Lyon), and my son and I started operations on January 26th. That day we captured, banded, and released nine birds. Sparrows went into the trap three times, three at a time. The two following Sundays we had the trap set all day—not a sparrow entered it.

The singular feature is not that House Sparrows that had been in the trap should be trap-shy, as they unquestionably are, but that this small minority should thus communicate their caution to the entire flock.

The last two Sundays in February I was out of town, but on March 2d the trap was set out again. Meanwhile two or three Song Sparrows had arrived upon the scene and were frequenting the neighboring shrubbery, and in the course of the day all three Song Sparrows (there proved to be three) one by one, found their way into the trap. Not a House Sparrow entered, though at times they crowded about the opening. We had not had the trap out since February 9th.

How did the few trapped sparrows communicate the *tabu* to their fellows? Have other observers noticed this same thing? Do House Sparrows become trap-shy as quickly when trapped birds are not released? Presumably not, as we understand they can be, and are, 'controlled' by trapping.—J. T. Nichols.

Weighings of the Northern Form of the Eastern Song Sparrow (*Melospiza m. melodia*).—The writer's station is directly on the south shore of Lake Erie in Ohio. While direct observation is impossible owing to the migrations taking place at night, the direction of the calls of migrating birds heard during foggy nights and other observations tend to show that the smaller birds, including sparrow, juncos, warblers, and thrushes, fly directly across the lake during the fall migration, a distance of not less than sixty miles.

For several years it has been noticed that the Song Sparrows arriving here in September and October, after nearly all the resident Song Sparrows have departed, have had weights not differing to any extent from the resident birds, but after a period of several days their weight increased until it averaged from three to four grams more than the weight of the resident birds. A possible cause is the weight lost during the uninterrupted flight across the lake. If this is true, then the same effect should not be observed in the spring when the flight from the south entirely across land affords opportunity to find food and rest when required.

From February 17th to 26th, 1930, the weather here was unusually warm, and on the 22d, when the temperature reached 72 degrees, a few Robins, Bluebirds, and Song Sparrows appeared in Lakewood. On the 27th winter again returned with a one-inch snowfall. At this time the first Song Sparrow came to feed at the traps, but it remained shy until four inches

of snow fell during March 2d and 4th. To determine the effect of fasting on the weight of this bird, it was kept supplied with water but without food for twenty-four hours, when it was released apparently as strong and active as before. The weight with crop full was 28.19 grams; at the end of six hours, 26.05 grams; at twelve hours, 25.21 grams; at eighteen hours, 24.60 grams; and at the end of twenty-four hours, 24.11 grams, showing a total loss of weight of 4.08 grams. The average weight of 25.61 grams compares favorably with average weight obtained for the larger form of Song Sparrow recorded by Charles L. Whittle (*Bulletin Northeastern Bird-Banding Association*, October 1929, p. 153), which is given as 26.00 grams. Mr. Meyers is quoted in the same article as obtaining an average weight of 26.25 grams for the same type of bird.

These Song Sparrows at this station have a length greater by from one quarter to one half of an inch than the summer resident form. The length of the individual mentioned, which was marked with band No. B98231, was 6.79 inches. The color corresponded with others of the northern form, being much browner than the resident form.—E. C. Hoffman, Forest Cliff Drive, Lakewood, Ohio.

Methods of Capturing Wrens.—Three species of Wrens may be found about our banding station in Glenolden, Pennsylvania. The Winter Wren (*Nannus h. hiemalis*) is a regular winter visitant, though found but sparingly. The House Wren (*Troglodytes a. aëdon*) is a common summer resident, nesting in the vicinity wherever there are bird-boxes. The Carolina Wren (*Thryothorus l. ludovicianus*) is a fairly common permanent resident. Carolina Wrens stay in pairs within a rather limited territory throughout the year. Thus it is evident that although all of these Wrens are regularly present, they never occur in numbers within the limits of our banding station.

Since the spring of 1923 we have banded three Winter Wrens, fifteen Carolina Wrens, and sixty House Wrens. The method of capturing many of these Wrens is the remarkable feature of their banding history. Wrens are almost entirely insectivorous birds, and the bait of bird-traps does not ordinarily appeal to them. Of course, the experiences of station-operators differ. Miss Marion A. Boggs of Waynesville, North Carolina, writes me that Carolina Wrens find ground nut-meats irresistible, and that they are moderately fond of cheese. Forbush in "Birds of Massachusetts" mentions that Mr. Don V. Messer, of Huntington, used Hamburg steak as bait with success. The only bait I have actually seen Carolina Wrens feed upon is suet. Since, therefore, Wrens are not readily attracted to traps by bait, it is evident that when we have caught them the lure, instead of being food, has undoubtedly been the characteristic curiosity of the Wren tribe.

Two of the Winter Wrens were taken in a Chardonneret trap. The third found its way into a screened porch, entering through a small hole in the screening.

Of the sixty House Wrens forty-five were banded as fledglings. Twelve of the adults were captured in wren-boxes with pull-string shutters. Two of the others were taken in government funnel traps. The third ran under a drop trap while we were standing near by. Mr. Gillespie ran quickly to the trap and dropped the open side before the bird escaped. This was one of the most unexpected captures we ever made.

Four of the Carolina Wrens were banded as fledglings just after they left the nest. The other eleven were adults, and eight of these have repeated several times. A pair came together into the porch through the same hole in the screening that lured the Winter Wren. A third Carolina Wren

entered through another hole in the screening a year later. A female that nested inside a garage was caught within the building in a net. One Carolina Wren was caught in a Chardonneret trap, and at various times three more were decoyed into this trap when their mates were placed in one of the compartments. Seven times Carolina Wrens have been caught in funnel traps, seven times in a round house trap, and twice in pull-string traps.

Within the past year these Wrens have been caught on the screened porch in a new way. There is a drain-opening one by three inches in size on the floor-level, which is usually kept closed by a hinged door. On two occasions when this door had been unintentionally left open, Carolina Wrens wandered in and were eventually discovered and captured. Since then the small door has been intentionally left open and three more Carolina Wrens have been captured. At least one Wren continues to come into the porch. It is now able to find the opening and escape before it can be captured.

A most surprising capture came one day in October. While seated at my desk, I heard the flutter of wings and looked up to see a Carolina Wren in the room. Although several windows were open, every one was tightly screened and there were no holes anywhere in the screening. Search eventually revealed the fact that an outside screen door had swung shut so gently that the catch was not sprung and was holding the door slightly open, leaving a crack less than two inches wide. The Wren had been obliged to come under the roof of an unscreened porch to reach this door.

That Wrens possess a trait which resembles human curiosity is a matter of common knowledge. Ornithological literature contains many references to Wrens that have wandered through small and unsuspected openings into buildings. This trait has undoubtedly been responsible for most if not all of our Wren captures, with the exception of fledglings and nesting House Wrens. Even in the case of those Wrens that were taken in traps, it was without doubt the characteristic spirit of investigation that brought them there, since the bait was not of a variety to tempt them. This realization suggests that a special technique might profitably be employed in capturing Wrens that cannot be taken by the ordinary methods of trapping.—MABEL GILLESPIE, Glenolden, Penna., March 12, 1930.

A Returning Pair of Barn Swallows (*Hirundo erythrogastra*). During the summer of 1927 a pair of Barn Swallows nested in my wood-house, but as I had not taken up banding at that time they were not banded. The following summer, 1928, the nest was again occupied, and the adults and four young were banded, the male bird wearing band No. B29204, placed on May 26, 1928, and the female B29221, on July 14, 1928.

During the first few days of May, 1929, the male bird returned, and about five days later the female appeared. They built a new nest about four feet from the old one and reared a brood of five, which were banded.

The adult female was caught, and the number read on July 3, 1929, and the male was caught July 5, 1929. After the young left the nest, they disappeared for a few days, and then the two adult birds came back and stayed in the vicinity of the nest for two weeks, frequently occupying their favorite perch on the electric wires near by, and occasionally going in to look the nest over.

Probably at least one of this pair has nested here all three seasons, and then, too, they remained together after the young were able to shift for themselves. —JOHN W. PIGGOTT, Bridgetown, Nova Scotia.

An Old White-breasted Nuthatch.—In the *Bulletin*, Volume IV (1928), pages 29 and 110, something of the history of White-breasted Nuthatch No. 56530 banded by Mrs. G. H. Caughey at Antrim, New Hampshire, was published. Under date of December 29, 1929, Mrs. Caughey writes that this bird, a male, banded May 4, 1923, repeated September 30, 1923; June 11, 1924; March 5, May 2, August 18 and 22, October 19, and November 15, 1925; February 11, 1926; May 5 and October 2, 1928; and May 25 and December 2, 1929. This bird is apparently a permanent resident, and on the last date given he was at least seven and one-half years old.—C. L. W.

"Der Vogelzug," a New Ornithological Journal—Bird-banding in several European countries, notably in Germany and England, has been carried on longer and more intensively than in the United States or Canada. In Germany in particular migration studies have been made by two thoroughly organized banding stations as parts of Vogelwarten, or bird observatories, located about four hundred and fifty miles apart east and west, one located at Rossitten, situated on a sandspit about forty-five miles long separating a large lagoon from the Baltic Sea in northeastern Germany. The other is located on the island of Helgoland in the North Sea, made famous by Gätke's long period of bird-observation. Bird-banding and bird-observation on Helgoland are conducted by a division of the German Biological Station located here. The Helgoland banding station is equipped for general biological research and has laboratories devoted to work in connection with bird-banding, which is conducted primarily to study bird-migration.

The banding work at both Helgoland and Rossitten is in charge of trained scientific observers. Dr. Rudolf Drost directs the work at the former station, and Dr. Ernest Schüz at the latter station.

The new journal is published under the auspices of these two observatories and banding stations and the German Ornithological Society, of which Dr. Erwin Stresemann is General Secretary. Dr. Drost and Dr. Schüz are also the editors of *Der Vogelzug*.

The new journal will be issued quarterly. The first number, which appeared in January of this year is reviewed in this number of *Bird-Banding*. This publication, backed as it is by well-known ornithologists and the leading German ornithological society, should serve to increase interest in bird-banding in the United States and in Canada.—C. L. W.

A Wood Thrush Return-1 S.—Miss Cora M. Teot, of New Haven, Connecticut, reports taking a Wood Thrush (*Hylocichla mustelina*) Return-1 S at her station. This is the first instance of a returning bird of this species that has come to our attention. It should be stated, however, that only a few individuals of this species have been banded.—C. L. W.

A Song Sparrow Return and Recovery.—The Biological Survey reports that a Song Sparrow banded by Dr. E. G. Rowland at Belchertown, Massachusetts, September 3, 1925, was trapped by Verdi Burtch at Branchport, New York, September 12, 1929. This bird, which was at least four years old when last recorded, was also a return August 8, 1926, repeating in September, 1926, on the 8th and 15th, and was probably on its nesting-area when banded. That it should have been in western New

York in the latter part of September, 1929, is an unexpected record and indicates that the bird moved westward from Belchertown after the nesting season was over, or that it did not again return to its old nesting area in 1929.—C. L. WHITTLE.

A White-Throated Sparrow Return-4 W.—White-throated Sparrow No. 181124, which was banded by me at Summerville, S. C., on March 2, 1926, returned this year for the fourth time. The bird was taken each successive year in the same place. It had a bright head when banded, and has retained it ever since. Following is the record by dates:

Banded	Mar. 2, 1926	
Returned	Feb. 3, 1927	Repeated Feb. 11, 12.
Returned	Jan. 7, 1928	Repeated Jan. 20.
Returned	Jan. 18, 1929	
Returned	Jan. 17, 1930	

—WILLIAM P. WHARTON.

BACK NUMBERS OF THE BULLETIN

The Secretary of the Northeastern Bird-Banding Association announces that there are no longer any full sets of the *Bulletin* available for distribution. Five numbers are lacking: Vol. I, Nos. 1, 2, and 4; Vol. II, No. 4; and Vol. V, No. 2. There is considerable demand from scientific institutions and individuals for these numbers to complete sets. If there are any banders having any of these numbers in duplicate, Secretary Charles B. Floyd will very much appreciate having the extra copies sent to him.

INDEX OF THE BULLETIN OF THE NORTHEASTERN BIRD-BANDING ASSOCIATION

With this number of *Bird-Banding* we are mailing an Index of the five volumes of the *Bulletin*, prepared by James MacKaye.

We believe that this index will be particularly serviceable since it is not confined to authors, titles, and species, but includes subjects as well, so that everything the Bulletin contains of any ornithological interest is made readily available to the user.

The officers of this Association greatly appreciate Mr. MacKaye's services in preparing the index and the thoroughness of his work.

Northeastern Bird-Banding Association

CHARLES B. FLOYD, *Secretary*.

RECENT LITERATURE

My Tropical Air Castle. By Frank M. Chapman. Published by D. Appleton and Company, New York and London.

A typical February day in bleak New England! I sit indoors by my open fire, watching the Chickadees and Goldfinches on my windowshelf, my greatest thrill the brief visit of a Myrtle Warbler to the bayberry spray in the fast-fading Christmas tree, then turn to the pages of this delightful book and contrast Dr. Chapman's day on Barro Colorado with my own, as he reclines in his easy chair in the shade of his little cabin and notes the activities of the Caciques and Manakins, the Oropendolas and Toucans, the Howling Monkeys and Coatimundis, in the branches of the great tropical trees, or paddles his slender cayuca in the haunts of Jacanas and Gallinules, Tapirs and Crocodiles, among the lagoons and inlets of Gatun Lake. It is a book which stirs the wanderlust in our veins and wakens all our latent desires to go a-birding in distant lands. It appeals to the nature-lover and the scientist alike. Its subtitle might well be "Vacation Days in a Laboratory," for Barro Colorado presents the unusual combination of an unspoiled tropical forest where all wild life is protected and undisturbed, with living conditions which include "all the comforts of home," ample scientific equipment, and congenial companionship. Not least among our pleasures in the perusal of this volume is reading between the lines, as the well-known scientist, a little tired perhaps of collecting and studying specimens and classifying dead skins, turns to a leisurely study of the book which Dame Nature has opened wide before him in this ideal spot.

This is not the place for a detailed discussion of the book, but a few of the chapter-titles may serve as a whet to one's appetite and a lure to the reading of the volume. The author's catholic taste in subject matter may be shown by such headings as "Casa Mia," "Two Widows of the Sandbox Tree," "Does the Turkey Buzzard follow his Nose?" "Cayuca Ways," "Who treads our Trails?" and "Presenting the Coati." The chapter on "The Oropendolas of Laboratory Hill" is the result of prolonged and careful study of these interesting colony-nesting birds, written with strict observance of scientific considerations, but in a manner that makes delightful reading for any one with a love of nature or of travel; while the story of Claudia, the captive baby Howling Monkey, shows a sympathetic treatment which may surprise those who know the author only from his scientific side. The half-tone illustrations and the line drawings by Mr. Jacques add much to the volume, and, all in all, it is a book which will be an addition to any library.—J. B. M.

The Natural History of the Double-crested Cormorant. By Harrison F. Lewis. Published under the auspices of the Province of Quebec Society for the Protection of Birds, Ottawa, Canada.

This little book, written by Dr. Lewis as his thesis for the Graduate School of Cornell University, contains in compact and readable form a vast amount of information about this interesting bird and is an example which might well be followed by others in the preparation of monographs on our birds. It contains not only a résumé of the literature on the subject, but much new material gathered personally by Dr. Lewis in the field and in the laboratory. The work contains numerous half-tones from photographs and two maps, one showing the breeding and winter ranges of the species and the other showing returns of banded individuals. This map records recoveries of sixty birds, thirty-five of which were banded in Saskatchewan by Reuben and Bert Lloyd, and two in Manitoba by J. A. Munro. These Western birds were all recovered within the Mississippi Valley, ranging from Ohio

to western Florida and to Texas. The Eastern birds were all banded in the lower St. Lawrence, most of them by Dr. Lewis in Canadian Labrador, and the recoveries are all from points on the Atlantic seaboard, from Newfoundland to Florida. There is no overlapping of the returns from the two different breeding-localities, and the map might represent the travels of two different species instead of members of the same race of birds. It is a further demonstration of the results which may be obtained from the banding of a considerable number of birds of a given species.—J. B. M.

Birds of Massachusetts and Other New England States, Vol. III, 1929. By Edward Howe Forbush.—The appearance of this long-awaited volume completes the series of this splendid State publication.

Upon the death of its author a year ago, the work of editing the volume fell upon the shoulders of Mr. Forbush's successor to the position of Director of the Division of Ornithology, Massachusetts Department of Agriculture, Dr. John B. May, who, in addition to his excellent editorial work, contributes a biographical sketch of Mr. Forbush, the texts on the Rough-winged Swallow, the Lark Bunting, and the Slate-colored Junco, and the chapter on "Recent Additions to the Avifauna of New England," treating of four species. These additional species were not known to have occurred in New England when the material for the first two volumes was written, or were discovered too late to be inserted in their appropriate places. They are the Lapwing, Lewis's Woodpecker, and Harris's and Golden-crowned Sparrows.

Mr. Maurice Broun contributes the accounts of Lawrence's Warbler, Brewster's Warbler, Maryland Yellow-throat, Canada Warbler, Redstart, and Hermit Thrush.

The volume contains thirty-one colored plates of one hundred and twenty-five species of birds. Of the birds included, Allan Brooks painted one hundred and six and Louis Agassiz Fuertes painted nineteen. The last birds painted by Fuertes for this volume were the White-throated and White-crowned Sparrows, Plate No. 70, fine examples of the work of this master painter of birds.

The bird paintings by Allan Brooks are also excellent, but a few appear less satisfactory owing to unusual poses or because the colors sometimes appear too intense or their definitions too sharp.

A large number of people interested in birds have eagerly awaited the completion of this work. Its usefulness will be very great for years to come, both to students of birds and as an instrument for increasing interest in birds throughout the country. This increased interest can be aroused by the State's separately binding the colored plates in the three volumes and selling them directly and through the Audubon Societies at a price just sufficient to cover the cost and postage.—C. L. W.

Der Vogelzug, I, No. 1, January, 1930, pp. 1-64, 4 figs. (maps).—This magazine is to be the official organ of the ornithological stations (observatories) of Helgoland and Rossitten, Germany, and to be otherwise open to contributions on bird migration, and on the various problems in which bird-banding is involved.

The initial article by Rudulf Drost, eleventh report of the bird observatory of the biological station of Helgoland (1926-1928), covers fifteen pages. From it we learn that the considerable space required for detailed report on returns of banded birds has led to the scheme of combining these by species, or sometimes groups of species, for better discussion and greater reference value, and has resulted in launching this new periodical. The physical

development of the station over the years concerned is given in detail—its observation, trapping, and laboratory facilities, collections and library, correlations with outside ornithological activity described. Attempts to organize a coöperative study of migration over wide areas are under way, particularly an international study of that crossing the North Sea. This is a National central office for bird-banding. Several pages of statistics show the number of birds banded on Helgoland, which had risen to over five thousand annually in 1927 and 1928, and totalled 22,342 from 1909 to 1928 inclusive. The numbers banded by the principal coöperators in different parts of Germany are also listed: over 1000, 4 persons; 500 to 1000, 7 persons; and so forth.

Two principal articles in this number concern the migration of the European Coot (*Fulica atra*) according to banding returns, by E. Schüz, and the wanderings of the Helgoland race of the Common Murre (*Uria aalge helgolandica*), by Rudolf Drost. The Coot in Britain is a resident or at most a local migrant, but eastward in the same latitude and to the north it seems to have the migratory instinct strongly developed in many cases. The longest course so far recorded by an individual, from Sweden to Spain, is about fifteen hundred miles. In most cases the Coot is probably a winter migrant; that is, it retreats before cold weather; but it also may cover a wide distance in spontaneous southward migration prior to the advent of cold weather. It may travel more quickly than one would suppose for so weak a flier, 164 miles a day; and it apparently crosses mountain-ranges in migration. A winter concentration (Traunsee near Gmunden) where banding was done, is described. Recoveries of birds here banded were obtained (some evidently breeding) in scattered localities at various distances more or less northeasterly. Nine years and one month is the longest life-span so far obtained for this species. The data for this admirable study comprise the more important banding-records for this species, including those already published which have been brought together from the scattered literature. The picture presented of the migration of the European Coot is quite comparable to what might be inferred from observation as to that of the American species, for which corroborative banding data are as yet unavailable.

Young Murres from the Helgoland colony for the most part migrate northward in fall to Scandinavian coasts; in winter they scatter southward to the English Channel, the west coast of France, and the Bay of Biscay. Most of the recaptures of adults at all seasons are from home waters, indicating that these are less wide-ranging than the young. So far there are few data on the return to Helgoland in the breeding-season—two adults only, as compared with one adult and two young of the preceding year in foreign waters at that period. Just this aspect of the matter is worth further investigation for its bearing on the problem of colonial races of sea-birds.

Other articles include a short report on coöperative observation by a 'network' of observers scattered along the coast near Rossitten (Schüz) and a summary of what has been observed of migration over the North Sea at Helgoland and adjacent coastal stations (Drost and Schildmacher). The general direction in fall, day and night, is here southwest, at times across the sea and at times along the coast, more or less dependent on weather conditions and the configuration of the coast. Then there is a review of the present bird-banding situation in Russia (H. Grote).

Under "Short Contributions" we have an appeal for an international network of stations for observing bird-migration on all coasts of the North Sea (Drost;) concerning the spring migration, 1929, at Rossitten (Schüz); unusual visitants on Helgoland in the spring of 1929 (Drost); A banded *Ardea p. purpurea* taken in Hessen-Nassau (Salzmann); mortality of

migrants along the coast (Robien); recovery of a German Red-backed Shrike in Egypt (Drost).

Under "Banding-technique" there is description of a convenient retainer for trapped birds; and discussion of placing the band on right or left leg, with the suggestion that all birds be banded on the right leg in even years (1930-1932), on the left in odd years (1931-1933). While, in the opinion of the reviewer, it is obviously impossible to place reliance on any system of right and left banding, with the numerous coöperators involved, at the same time and in particular cases such may often add value to ensuing sight observations. The plan followed by some of his associates of banding fledglings on one and adults on the other leg, however, seems the most likely to be of value in general. It proved helpful in a recent study of the Brewster's Warbler problem by members of the Linnaean Society of New York. On the other hand, the value of the reviewer's sight observations on a small group of banded adult House Sparrows a few years ago was enhanced by the fact that these had been banded indiscriminately, males and females, rights and lefts, thus dividing them for observation purposes into four lots where otherwise there would have been two. After the nesting-season he has seen young banded Terns at his locality on the south shore of Long Island, presumably from colonies to the eastward. Were the Massachusetts colonies banded one way and the New York colonies the other in a given year, the interest in such observations would be doubled. In short, for observation purposes he would favor one standard leg, to be varied as it might help some given problem.

Der Vogelzug contains a rather comprehensive review of the literature and it may be helpful to American workers to run through the titles of the papers discussed, where these are not in English, as follows: *Lucanus, Fr. v.*, 1929, The Riddle of Migration: Its Solution in Experimental Ways by Aviation and Bird-Banding, 286 pages, 4 figs., 1 pl. *Harnisch, Erich*, 1929, Bird-Migration in the Light of Modern Investigation, 131 pages, 15 plates, text-figs. Leipzig. *Schüz, E.*, 1929, Bird-Migration, Aus der Heimat, Naturwiss. Monatsschr., XLII, No. 3, pp. 65-87, 16 figs. A comprehensive and clear review of our present knowledge of bird-migration. *Schenk, Jakob*, 1929, Value and Employment of Migration Dates in the Study of Migration, Verhandl. VI. Intern. Orn. Congress, Copenhagen, 1926, pp. 270-288. *Drost, Rudolf*, 1929, Concerning Bird Wanderings in the Winter Months, with a discussion under the heading "Bird-Migration and Weather," Verhandl. VI. Int. Orn. Congress, Copenhagen, 1926, pp. 62-79. Concludes that not so much the wind or wind-direction as such but "temperature transported by wind" is an important factor. *Dupond, Ch.*, 1929, Bird-Banding in Belgium, 1928, *Le Gerfaut, Rev. belge d'Ornith.*, XIX, No. 2, pp. 43-52. Many recoveries of birds banded in Belgium, mostly in a southwesterly direction from the banding station. A *Carduelis spinus* female banded at Oordegem, April 3d, was caught by a cat on July 30th at Trysil, about 112 miles north of Oslo, Norway. *Banded Birds*, 1929. *Le Gerfaut, Rev. belge d'Ornith.*, XIX, No. 2, pp. 11-13. Recoveries from numerous Black-headed Gulls (*Larus ridibundus*) banded in Holland show that they followed the coast southward in migration, the most southerly record being near Cadiz, Spain. *Lemming Mortensen, I.*, 1929, On Banded Storks (*Ciconia alba*), *Dansk Orn. For. Tidskr.*, XXII, No. 4, pp. 126-132. Recovery of Storks banded in Denmark in various European countries, Asia Minor, and South Africa. *Skovgaard, P.*, 1929, *Danske Fugle*, X. No. 1, pp. 189-190. Bird-banding report of the Danish central office; in 1926 there were 9386 birds banded; in 1927, 15,409. *Skovgaard, P.*, 1929., Banded *Sterna cantiaca* [*sandvicensis*], *Danske Fugle*, X. No. 1, pp. 197-199, 1 map. Since 1919 there have been 2207 of these Terns banded, with 24 recoveries on the west coasts of Europe and Africa south

to the Gold Coast. *Skovgaard, P.*, 1929, *Danske Fugle*, X, No. 1, pp. 200-202, 1 map. Report on a few interesting recoveries of birds banded in Denmark, for instance the Red-backed Shrike from the delta of the Nile. *Skovgaard, P.*, 1929, Banded *Sterna anglica* [*Gelochelidon nilotica*], *Danske Fugle*, X, No. 1, pp. 215-216, 1 map. From 685 of these Terns banded since 1918, 11 recoveries. Unlike *S. cantiaca* this species migrates to a considerable extent over the land, probably through central Europe to the Mediterranean. Recoveries of an individual on the west coast of Africa in November and a young bird in September at Barbados, W. I. *Skovgaard, P.*, 1929, Crossbill-Invasions 1927, *Danske Fugle*, X, No. 1, 1929, pp. 239-255. Compilation of reports of the great European invasion of the Crossbill in 1927. *Ordt, G. J. Van*, and *Bol, C. J. A. C.*, 1929, Concerning the Orientation Problem in Birds. Removal of sex glands in the Carrier Pigeon, *Biol. Zentralbl.*, XLIX, No. 3, pp. 173-186. Homing ability of birds operated upon not impaired. *Wergold, H.*, 1926. Measurements, weights, and migration, correlated with age and sex in migratory birds of Helgoland, Wiss. Meer, N.F. Abt. Helgoland, XV, Festschr. f. Fr. Heincke, Abh. No. 17, pp. 1-73. *Drost, Rudolf*, 1929, European Banding-Centers, *Orn. Monatber.*, XXXVI, pp. 161-172. Statistical and tabular presentation of the status of bird-banding in Europe. *Schüz, E.* 1929. Spring Migration of *Colymbus arcticus* in the Rossitten Region, *Mitt. Ver. sächs. Ornith.*, II, No. 6, pp. 289-294. A large migration of this species in late May, 1929, with general northwesterly direction, occasions request for coöperative observations on its migration. *Sunkel, W.*, 1929, Trapping birds for Science and aviculture, pt. 3, pp. 193-351, A. Troschütz, Hannover. *Haverschmidt, Fr.*, 1929, *Ardea*, XVIII, ½, pp. 24-37. Observations particularly of water and wading birds with some notes bearing on migration. *Bouma, J. P., Koch, J. C., Dr.*, and *Malssen, J. F. M. Van*, 1929, *Ardea*, XVIII, ½, pp. 38-57. Report of a Dutch central station for bird-banding, remarks on capture, directions of migration, etc. *Brower, G. A.* and *Haverschmidt, Fr.*, 1929, The severe winter of 1928-1929, *Ardea*, XVIII, ½, pp. 61-69. Many migration dates, and statements of direction of movement. *Moltoni, E., Riv. Sci. Nat.* "Natura," XIX, pp. 179-182, 2 figs. On the beginning of bird-banding in Italy. *Moltoni, E.*, 1929, *Riv. Sci. Nat.* "Natura," XX, pp. 69-72. Recovery in Italy of birds banded in more northerly European countries. *Levenskjold, H. L.*, 1929, *Norsk Orn. Tidsk.*, X (3 ser.), pp. 115-183. Observations covering fifty-nine years, with many references to migration, and a migration table for fifty-four species. *Schaaning, H. Tho. L.*, 1929, Banded Birds VII, *Norsk. Orn. Tidskr.*, X (3 ser.) pp. 202. Recoveries of banded birds. *Svendsen, G.*, 1929, *Norsk. Orn. Tidskr.*, X (3 ser.), pp. 206. Comparison of arrival dates in 1928 and 1929. *Hakenstad, P.* 1929, *Norsk. Orn. Tidsk.*, X (3 ser.), p. 211. Arrival dates in the spring of 1929. *Lönnberg, E.* 1929, Fauna och Flora, pp. 117-124. Fifteenth contribution of banding-results from the National Museum in Stockholm. *Lönnberg*, E., 1929 *Svensk. Vetensk. Skrift Nat.*, No. 11, pp. 1-21, 6 maps. Migration of *Corvus cornix*, *Sturnus vulgaris*, *Turdus piliaris*, *T. philomelos*, *T. musicus*, *T. merula*, and *Columba palumbus*, based on banding results of the National Natural History Museum at Stockholm. All these species have a more or less southwesterly migration direction, in single cases more southerly. *Jägerskiöld, L. A.*, 1929, Report of the biological society of Göteborg, on banding results, pp. 26-83, 2 figs., 33 maps. Statistical tables. Maps showing migration of a number of species, in a general southwesterly direction in almost all cases, except the Rough-legged Hawk, which travelled south and southeast, and the Black-headed Gull (*Larus ridibundus*) which took a southerly direction. *Schifferli, A.*, 1929. Other interesting recoveries from the Swiss ornithological observatory at Sempach, *Der. Orn.*

Beobachter, XXVI, No. 9, p. 172. *Schifferli, A.*, 1929. Fifth report from the Swiss ornithological observatory at Sempach (1928). *Der. Orn. Beobachter*, XXVII, No. 1, pp. 2-13. Contains report of banding activities and numerous interesting recoveries. The following sentences are quoted. "It is a misinterpretation of bird-psychology when marking is neglected due to apprehensiveness." "Whoever bands can affirm how bird-protection in furthered by banding." *Bretscher, K.*, 1929. New contributions concerning migration in central Europe. Quarterly of the Nat. Ges. Zürich, LXXIV, p. 1-49. An attempt in working over recorded observations by mathematical computation to recognize migration-routes. There are tables of migration-dates, etc., for various species. The general conclusion that there are definite migration-routes, in many cases along river valleys, seems to the reviewer (Drost) out of line with the results of recent (particularly bird-banding) investigations. *Schenk, J.*, 1929. *Verh. X Internat. Zool. Congr.* 1927, Budapest, Sect. VIII, pp. 1386-1401. Study of combined records of European banding-centers. Statistics as to the distance of point of recovery in the breeding-season from birthplace, give 16 [should be 10?] km. or less., 80 per cent; 10 to 50 km., (approx. 6 to 31 miles) 10 per cent; 50 to 100 km. 3.5 per cent; over 100 km., 6.5 per cent. *Schenk, J.*, 1929, Bird-banding in Hungary in the Years 1926-1927, XII report with 2 figs., *Aquila*, XXXIV-XXXV, pp. 53-85. Banding-statistics; studies of the return of breeding birds and young, banded, to the same breeding-area; and banding-data bearing on migration in various species. Adults captured on the nest and banded, and looked for in later years. Such return proved for adult Kentish Plover, Lapwing, and Blacktailed Godwit, and young Lapwing, Black-tailed Godwit, Ibis, and Herons. The oldest banded bird of Hungary is a sixteen-year-old *Ardea purpurea*. *Schenk, J.* 1929, The Appearance of the Rosy Starling (*Pastor roseus*) in Hungary in the Years 1924-1926, *Aquila*, XXXIV-XXXV, p. 114-121, 4 pl., 2 fig. Faunistic and ecological data. Plates figure breeding-places and nests; figures show breeding-stations in grasshopper areas in Hungary, and points of recovery of banded birds (southeast to India). *Warga, K.*, 1929. Bohemian Waxwing invasion in the years 1923-24, 1925-26, and 1927-28, and a review of previous invasions. *Aquila*, XXXIV-XXXV, pp. 155-183. *Warga, K.*, 1929. Migration dates from Hungary, X, Report for 1927. *Aquila*, XXXIV-XXXV, pp. 257-305. *Vasvari, N.*, 1929, Winter quarters of *Branta ruficollis* from a faunal point of view, *Aquila*, XXXIV-XXXV, pp. 228-241. The migration of this goose is correlated with that of *Anser albifrons*, and it is difficult to assign to it definite winter quarters. Some fifty other foreign titles are merely listed.—J. T. N.

The Canadian Field-Naturalist. Volume XLIII, 1929. This periodical, published by the Ottawa Field-Naturalists' Club, contains, in addition to occasional notes on bird-banding, the official Canadian record of bird-banding returns. Its nine issues each year contain many articles of interest to the zoölogist, the botanist, and the geologist. In the January number of the present volume is an article by Theed Pearse on a colony of Glaucous-winged Gulls in the Gulf of Georgia, British Columbia. Some four hundred young birds were banded, with only eleven recoveries in a period of six and a half years. The farthest recovery was from Seattle, Washington, of a bird banded two years previously. The writer concludes, "In the previous article (*Canadian Field-Naturalist*, October, 1923) it was suggested that these Glaucous Wings nesting around here do not migrate much and certainly the more recent records bear this out."

In the February issue W. Philip Gerald suggests the use of a wide mouthed glass preserve jar as a gathering-cage to prevent injuries to ex-

cited captive birds. Manley Miner reports in the May issue that a pair of Jack Miner's banded Canada Geese, with a family of three young, spent some time in the protection of another privately maintained sanctuary about one hundred and fifty miles east of Mr. Miner's banding station at Kingsville, Ontario.

The McCabes of Barkerville, B. C., record in the November issue, the constancy during two seasons of a pair of Red-breasted Sapsuckers. These birds, banded at their nest in June, 1927, reappeared on April 15, 1928, and soon began another nest. They were recognized by their "right and left" banding, and later the female was taken, though the male was not. We have few instances on record of the continued mating of wild birds.

We have space to record but a few of the recoveries listed under the official Canadian returns. A Black Duck banded at Lake Scugog, Ont., was killed in Maryland when at least seven years old, while a Crow banded as a nestling in Saskatchewan was shot five years later only a mile and a half from the place of banding. Other interesting recoveries are a Bronzed Grackle banded near Ottawa, recovered in North Carolina; a Song Sparrow banded in Massachusetts, taken in Nova Scotia; a Blue Jay from Rhinebeck, N. Y., taken in New Brunswick; Herring Gull, Wisconsin to New Brunswick; Robins banded in Saskatchewan and taken in Louisiana and Georgia; Caspian Tern, Quebec to North Carolina; Arctic Tern, Labrador to France; Common Tern, Massachusetts to Ontario; Black-crowned Night Heron, Saskatchewan to Georgia; and many duck and gull recoveries. A great deal of space is wasted, however, in the opinion of the reviewer, in recording as "returns" young birds picked up dead near the place of banding which had evidently never left their natal ground, and many other birds found at the place of banding within a few days of banding. These records can only be of interest to the bander himself or to a possible student of bird mortality, and the latter could obtain better results by a questionnaire. An extreme case is that of a Robin banded in April which repeated twice at five-day intervals and two weeks later "*was presumably killed* by a cat at the same station. *Only the feathers were left* and as this bird was seen no more *it is thought* that No. 269,920 was the bird which the cat caught" (italics ours). The February issue records seventeen Great Black-backed Gulls, each banded as a juvenile in July, and "found dead on the Island on which it was banded—in October. The bird had apparently died a long time before its body was found."—J. B. M.

CORRESPONDENCE

BIRD-BANDING AND TERMINOLOGY

Editor of *Bird-Banding:*

It seems that the discussion of the use of terms such as "repeats" or "returns" in bird-banding promises only to increase any slight confusion there may be, or rather to cause confusion where none had before existed. The real confusion is not in the use of words, but in the failure to recognize two entirely different purposes and methods in banding; to recognize these two quite different purposes will help clarify the discussion of the use of words.

Prior to 1920, banding was carried on by very few operators, in a small way, and chiefly as a study of whether birds do come back to home and nest. As the importance of these records became recognized, banding was taken up by the United States Biological Survey, and bands have since been issued by the Survey to operators licensed by Federal permit, and all records of the bands placed upon birds are filed with the Survey.

The chief purpose in this undertaking by the Survey was to get records yielding information on migration anddistribution of birds. For this each banding-record is intended to be simply the exact record of taking a certain individual at a certain place at a certain time. Great accuracy is required to supply only exact facts without any frills or guesswork, and the office work in handling the details, is tremendous. When it is realized that these reports come from some sixteen hundred persons who have volunteered, very few of whom have any scientific background, and still less any training in classification, charting, or tabulating, it must be evident that the cooperator must not be asked to do any theorizing or discriminating, but give only the bare facts. I do not speak for the Biological Survey, but I can easily see just sixteen hundred reasons why the Survey should not adopt any complicated system or ask of their coöperators any exercise of judgment as to the status of the bird. In fact, in some ways I can see where it might be wise if terms like "Repeats" or "Returns" were abandoned in Survey reports. The latest instructions from the Survey are to the effect that in future only returns are to be reported, and these are to be forwarded on special cards, so it will be evident that the intent of that office is to simplify the method of reporting as much as possible.

Let us turn now to quite a different purpose of banding, a purpose which was only partly contemplated or appreciated when banding as a method was adopted by the Biological Survey. Bird-banding makes it possible for the scientist to make many kinds of studies of birds in which the identification of the individual bird is the basis of work; renders it possible to make most careful laboratory studies of living birds under all sorts of natural and controlled conditions.

It is the purpose of the Bird-Banding Associations and of this journal to encourage each bird-bander who has time and training to develop his own lines of study to the highest degree. Studies of this sort are conducted by persons trained in the methods of acquiring exact information, and of digesting such information by tabulation and the making of graphs or charts. Reports of this sort of work may not necessarily be entered into the reports that are sent to the Biological Survey, nor should they be allowed by the Survey to encumber their records, as work of this kind constitutes original research by the operator concerned and, when carried to a logical conclusion by him, should go into suitable magazines or other publications. No better example have we of operators of this class than Mr. and Mrs. John A. Gillespie, able, experienced workers, who are producing abundant and valuable results; but in the opinion of the writer, operators of this class should be allowed their methods and terms without dictation from others whose needs may not be the same. I need confess that ten or fifteen years ago I thought of "repeats" as being of no value; simply so much unproductive rubbish, and we then marked birds "Return" in much the same way as we might use an asterisk to mark a record that was interesting. To-day in my laboratory nearly every bird of the thousands handled during the summer deserves the asterisk, because each time a bird is handled it gives data on weight, temperature, plumage, or some other kind of information.

Such a system of terms as is suggested by Mrs. Gillespie is, therefore, impracticable in our work, yet it may be of great value in the interpretation of her results.

Let those who find use for a system of this nature use it, but two things I would advise in regard to it. First do not use or narrow the term "returns" to some new or limited meaning. That word "returns" as used for "reports" is authorized by the dictionary, and has for many years been used in "election returns," "tax returns," "advertising returns" and all sorts of

other "returns" without any confusion of mind; the word has been so used in bird-banding for many years before any one discovered that it could be confusing, and, during many years of teaching bird-banders, I have never discovered among the hundreds of operators any confusion in its use. So leave it to us to use as in the past. And second, do not ask the Biological Survey to adopt a complicated system of records nor expect them to demand discrimination from operators.

In looking over the "Terms" and "Abbreviations" in Mrs. Gillespie's interesting paper[1] I feel that very few of the birds that I have ever handled could be designated under her suggested classification. It seems to me to require a great deal of guesswork to name a bird as "permanent resident," "summer return," "winter return," or as "migrating north," or "migrating south." Birds *en masse*, the flocks as they come and go, yes, one may be fairly certain, as to them, but as to any individual, I have my doubts. True, in reports of ten years ago from Thomasville I classed certain birds as "Residents," others as "Migrants," but even then I carefully explained that it was not intended as definitely describing the status of any individual bird; and of late years I became more skeptical of my ability so to describe them.

S. Prentiss Baldwin.

Thomasville, Ga., March, 1930.

A NOTE ON BIRD-BANDING TERMINOLOGY

Editor of *Bird-Banding:*

The instructive paper entitled "Suggestions for a Revised Bird-Banding Terminology," by Mabel Gillespie, on page 14-19 of Vol. I, No. 1, of your journal has just been read by me with interest and profit. Its author's zeal is evident and her logic convincing, and the paper concludes with a list of sixteen different terms, some of which have several minor subdivisions, to be applied to the rediscovery of a banded bird, alive or dead. These are considered adequate for all present needs, though liable to future additions, to meet the possible requirements of further refinements in the study of birds by placing bands on them.

While some may have use for all the terms thus provided, it may be hoped, in passing, that bird-banding will not become smothered under an elaborate and highly technical terminology, unintelligible to all but the initiated few, such as is the bane of many a field of science. It is generally possible to be thoroughly scientific and accurate in quite simple language, and this, it seems to me, is an aim well worth keeping in mind.

However, what I particularly wish to comment on here is the surprising absence from the proposed terminology of any general term, inclusive of all the others. The terminology to be used in indicating the rediscovery of a banded bird has been pushed on to a multiplicity of terms, which correspond to various subdivisions or types of renewed meetings with such a bird, according to present refinement of ideas on the subject, but no term by which the undivided concept of the report of a banded bird subsequent to its banding may be referred to is provided. Surely there is need for such a term. A bird-bander, or any other person, for example, may have occasion to refer to the number of such occurrences, relating to birds banded

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[1]Suggestions for a Revised Bird-Banding Terminology. *Bird-Banding*, vol. I, no. 1, pp. 14-19, January, 1930.

by him, or banded in a given area, or as the case may be, in a given period of time. How shall he do it? It would be erroneous to speak of "100 repeats, returns, and recoveries" (just as it is erroneous to speak of "100 species and subspecies"), for it is a primary mathematical rule that unlike things cannot be added. Before forming or using a total, we must bring to one common term all the units with which we may be dealing, and no such common term appears in the terminology proposed in Mrs. Gillespie's paper.

I sincerely hope that Mrs. Gillespie, who has carried bird-banding terminology to its present advanced state, will propose for all workers in this field a simple term that will meet this real need.

HARRISON F. LEWIS.

Ottawa, Canada, January 23, 1930.

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